Graduate School of Asia-Pacific Studies, Waseda University
Journal of the Graduate School of Asia-Pacific Studies
No.31 (2016.3) pp.165-185

Effects of the Employment Permit System for foreigners on the employment of locals in South Korea

Jiehyun Roh *

外国人労働者が韓国人の雇用状態に及ぼす影響

―韓国の外国人雇用許可制を中心に―

ロ　ジヒョン*

Abstract

Until the mid-1990s, globalization to the South Koreans was equivalent to rice importation, or it was believed to offer the country opportunities to sell more Samsung washing machines or TVs to developed countries. To South Koreans, globalization involved activities like importing more agricultural products, which farmers opposed, instead of selling more home appliances.

However, globalization eventually developed in a direction that South Koreans had not imagined. People felt that, along with the trade of products, foreign workers were also being "imported," due to the changes in the labor policy after the year 2000. This eventually led to job competition among the domestic South Korean workers and also among the Pakistanis, Nepalis, Vietnamese, Chinese, and Korean-Chinese compatriots, who emigrated from Korea in the past and whose language abilities are similar to those of the South Koreans.

The present study investigated the economic influence of globalization, particularly the immigration of foreign workers, on the workers of the host country. This study analyzes the effects of the employment of foreign workers on the employment status of South Koreans, based on data obtained from the 2005-2011 Workplace Panel Survey, which is conducted every two years by the Korea Labor Institute.

The examination of the effects of the employment of foreign workers on the employment and turnover of locals (South Koreans) indicated that the effect varied by industry. In the case of the manufacturing industry, there was no significant correlation with the recruitment of new, regular South Korean employees.

When the marginal effect was examined depending on the industry code, foreign workers more substantially substituted for non-regular South Korean employees in the service and construction industries.

The larger effect of the foreign workers on the South Korean labor market compared to that in the manufacturing industry is thought to be because there were many compatriot workers (H-2 visa holders) who have "similar labor quality and high substitutability."

* Graduate School of Asia-Pacific Studies, Waseda University, Doctoral Degree Program

1. Introduction

In the past 10 years, the South Korean government implemented two policies relating specifically to foreigners.

South Korea over the past four decades has demonstrated incredible economic growth, but during the period of industrialization most males moved to the cities. Some remained in their hometowns, but marriage influenced this urbanization. Korean females hesitated to live in rural areas. Since the 1990s, brokered marriages, where Korean males in rural areas are connected with other Asian spouses, have increased. In the process, many "foreign" brides experienced human rights violations. They could not get assistance if their Korean spouses acted in violence or drunkenness. On the other hand, some brides who only wanted a Korean visa disappeared after the wedding ceremony. Even though multicultural families increased, Korean society was not prepared to accept the new change.

The government felt a necessity to establish a "multicultural policy" to help children of multicultural families. One of the reasons for the government's decision was a very low birth rate among South Korean females. According to statistics from the Ministry of Gender Equality & Family, married immigrants living in South Korea represented approximately 305,445 persons in 2015.

The other policy “Employment Permit System for Foreigners,” introduced many low-skilled foreign workers into the country. In the 1990s, foreign workers entered South Korea for the first time based on the Industrial Trainee System and were employed by companies in the manufacturing industry. In other words, South Korean companies accepted people to be “trained” for the first time. In reality, however, such people were low-skilled laborers. Foreign workers continuously entered industries that the South Koreans avoided (the 3D industries). It was difficult to imagine the South Korean economy without them.

As the influx of undocumented foreign workers in the country and the problems of overdue wages and human rights violations by certain South Korean employers became persistent issues, the South Korean government felt it necessary to legalize the system. In other words, the government gave foreign workers a chance to make money by finding employment in South Korean companies, and it also gave South Korean employers a chance to reduce their labor costs and to improve the country’s labor shortage problem. Due to the Employment Permit System for Foreigners policy, the relocation of South Korean factories to China, which had accelerated since the 1990s, ceased substantially because the need to move industry to China for cheap labor costs decreased.

The contents of this paper are as follows: (1) examination of the changes in the foreign-worker policy in South Korea; (2) investigation of the Employment Permit System for Foreigners policy, which was first implemented in 2004; (3) examination of the factors determining the employment of foreign workers (through an investigation of the companies that actively employed foreigners); and (4) examination and analysis of the effects of

employing foreign workers on the employment of South Koreans without work experience, South Korean employees with prior work experience, and regular South Korean employees.

2. Employment Permit System for Foreigners

2. 1. Changes in the foreign-worker employment system

With the initial implementation of the Industrial Trainee System in December 1993, foreign workers entered South Korea for the first time. The goal of this policy introduction was to resolve the manpower shortage in small and medium-sized companies. Thus, foreign workers entered South Korea as trainees rather than as workers.

In the early stages of the policy's implementation, the training period for foreign workers was two years. From April 1998, however, it was supplemented so that foreign workers could be employed in South Korea for one year if they passed a designated qualification test after the two-year training. In December 2001, the training period was changed to one year, and the employment period was changed to two years. In the policy's early stages, the number of trainees was 20,000, but it increased to 145,000 in 2002. Also, the nationalities of the trainees gradually increased to include people from 14 countries, including China and Indonesia.

Labor laws were not equally adopted, and foreign workers were called "trainees," not "workers." By law, minimum wage, limitations of working hours, and insurance benefits were not available for trainees. Many international organizations have criticized the ridiculous "trainee" system.

Foreign workers came to South Korea to make money but had to return to their home country after one year. In some cases, however, aliens could not repay the money they had paid to the broker who facilitated their entry into South Korea after one year. Thus, they disappeared and became undocumented foreign workers. They worked in a poor working environment with unfair wages, and in some cases, employers violated their human rights. The factory owners also had numerous complaints, saying, “It is unreasonable that trainees have to return to their homeland shortly after they get used to the work.”

According to the Bank of Korea, the growth rate during the 1990s was very high. In 1992, it was 6.2%, and in 1993, it was 6.8%. Booming industries needed more low-skilled workers in the early 1990s.

To address these problems, the government implemented the Employment Permit System, which accepts low-skilled foreign workers in August 2004. It was separately implemented, along with the existing Industrial Trainee System. Then, on January 1, 2007, a number of systems were integrated into the Employment Permit System.

The Employment Permit System allows companies that cannot find domestic manpower to legally employ foreign laborers for simple jobs. In addition, the employment procedure was transparent as far as the South Korean government and the foreign workers' governments

were concerned. The manpower selection was conducted with fairness and trust so that the workers would not have to pay a considerable fee to a broker. It is considered a step forward from the Industrial Trainee System: the foreign workers sign an employment contract, as with the South Korean workers, and the Minimum Wage System is also applied to foreign workers.

The Industrial Trainee System was implemented mostly for workers from Southeast Asian countries, while the Employment Management System, introduced in 2002, favored foreign workers with Korean ancestry. From 1910 to 1945, the Japanese ruled Korea, and in those days (Joseon dynasty period), many Koreans emigrated to China, especially Manchuria and Central Asian countries, for economic and social reasons.

Since the Japanese colonization period began in 1910, people who lost their territories went to the North. Manchuria was believed to be a "territory of chance." China did not prohibit the Koreans from coming and clearing the land. In the early 1940s, Japan forced Korean males to serve in the Japanese army and to work in coalmines. Migration accelerated, and most migrants did not return to the Korean peninsula after the end of World War II. During the Cold War, China and South Korea did not have a relationship. After South Korea and China established diplomatic ties in 1992, Korean descendents were able to visit South Korea.

According to the Ministry of Foreign Affairs, overseas ethnic Koreans make up 7,184,872 persons as of 2015. Among them, the main countries where they reside are: China (2,585,993), the United States (2,238,989), Japan (855,725), Canada (224,054), Uzbekistan (186,186), Russia (166,956), and Kazakhstan (107,613).

Various industries were allowed to employ these “compatriots” for a longer time than general foreign workers. On January 1, 2007, this Employment Management System was also integrated into the Employment Permit System.

Unlike the E-9 visa, which is mostly issued to workers from Southeast Asian countries, the H-2 visa, which is issued to compatriot workers, allows employment in various service industries in addition to the manufacturing, construction, agriculture & livestock, and fishing industries.

In principle, E-9 visa holders work at one workplace and can change jobs up to three times, only when there is a major reason for the change, such as safeguarding the worker’s human rights or closure of the workplace. On the other hand, H-2 visa holders can freely change jobs as often as they want.

2.2. Statistics on foreigners in South Korea

According to the Korea Immigration Service (Table 1), as of December 31, 2013, the number of foreigners staying in South Korea for a short or long time, excluding tourists, was 1,576,034 (1,392,928 legal aliens and 183,106 undocumented foreign workers). The number

Table 1. Statistics on foreigners with employment qualification in South Korea

(As of Dec. 31, 2013; unit: person)

Classification	Total	Professional personnel	Simple laborer
Legal foreign workers	478,616	45,379	433,237
Undocumented foreign workers	70,586	4,787	65,799
Total foreign workers	549,202	50,166	499,036

Source: Monthly Statistics of the Korea Immigration Service, December 2013.

of foreigners staying in South Korea increases every year (1,445,103 total foreigners in December 2012).

Aliens' purposes for staying in South Korea were: short-term visit, study, practice of a religion, general teaching, foreign-language teaching, practice of a professional occupation, working as an artist, marriage immigration, and trading (trading company). Also included are non-professional employment and visiting employment.

Among foreigners in South Korea, the total number of foreigners providing labor was 549,202 (50,166 professional personnel and 499,036 simple laborers). Foreign workers with an E-9 visa originated from Vietnam (50,488 workers), Indonesia (29,029 workers), Cambodia (25,281 workers), Thailand (22,434 workers), Sri Lanka (21,093 workers), Philippines (20,632 workers), and Nepal (18,236 workers).

On the other hand, among the 240,178 visiting employees (H-2), the Korean-Chinese accounted for the largest portion (228,049 employees).

3. Studies on the Employment Permit System in Korea

The Employment Permit System was introduced in 2007. A limited number of studies considered time-series analysis. However, a considerable number of studies have dealt with the effects of the Industrial Trainee System (1990s) on the employment and wage levels of Koreans.

Although there may be a slight difference, the Industrial Trainee System is similar to the Employment Permit System. Both import low-skilled workers who are predominantly employed in the manufacturing industry. Therefore, it is necessary to examine the papers that studied the systems' effects on Korean society.

First, Lee and Park (2008) estimated the distribution of foreign personnel for each industry using the resident alien statistical raw data sample and the published statistical data of the Ministry of Justice. The results indicated that the foreign personnel occupied 6% of the manufacturing industry, approximately 10% of the construction industry, approximately 5% of the food service and lodging industry, and 17% of the domestic service industry.

Kwon and Jeon (2009) analyzed which companies employed many foreign workers. This is significant in that, based on the Workplace Panel Survey of the Korea Labor Institute, the research subjects included all business types except the manufacturing industry. The variables included the year of foundation, labor cost attitudes of the companies, the proportion of Korean non-regular workers to the entire workforce, turnover, and wage level.

The results indicated that the foreigner employment rate was high when a company had no labor union, had a high female worker employment rate, and had low computer usage. However, the disadvantage of the above-mentioned study was that it only used the Workplace Panel Survey in 2005. It is difficult to accurately examine the effects of the Employment Permit System that was actively implemented after 2005.

The economic impact of foreign workers can be divided in terms of employment and wage. First, Han (2005) examined the effects of the foreign workforce on the employment and unemployment of Koreans. Han (2005) analyzed "trainees" between 1997–2001, before the Employment Permit System for foreigners began in 2007. The study used data collected from sampling 10% of the foreign workers in the manufacturing industry from the Small and Medium Enterprises Survey. The Wage Structure Survey was used to compare wage levels. The study subdivided the manufacturing industry into 20 items such as Rubber and plastic products industry, Metalwork products industry, Furniture manufacturing industry and investigated the increases in the number of foreign workers between 1997 and 2001 and the changes in the employment rate of locals in the fields where there was an increased number of foreign workers. Locals were classified into unskilled and highly skilled (based on their education level), and employment rate (based on their gender).

Results showed that low-skilled Korean male workers, who received middle school education or lower, experienced the most damage when the number of foreign workers increased. The study did not find statistically significant evidence that foreigners lowered Koreans' wage levels.

Kim (2009) analyzed whether the employment of foreigners affected the job relocation and dismissal of Koreans, based on their workplaces (Duration Model). Foreign workers, who were registered in the Employment Insurance system between August 2004 and December 2005, were investigated using the raw data of the Employment Insurance. The variables were age, gender, and education level of Korean workers, and the employment level of foreign workers.

Results showed that when the proportion of foreign workers increased by 10%, the risk of unemployment for locals increased by 0.65%. However, this has limitations because Kim (2009) investigated the period between 2004 and 2005, which was before the active implementation of the Employment Permit System for Foreigners. The research period was limited to 2004–2005 because the Employment Insurance, which had been an obligatory subscription until that time, was changed to voluntary subscription in January 2006.

On the other hand, there was a finding in which the negative effects of foreign workers on the employment of Koreans were insignificant or complementary. Jo (2004) empirically analyzed the substitutability of foreign workers and local workers for each business type, based on the Foreign Worker Employment Survey of the Korea Labor Institute. The substitution elasticity and self-elasticity were estimated by classifying the labor input elements for production into skilled labor, low-skilled labor, simple labor/service, office management, and foreign labor.

The results showed that foreign workers complemented the domestic labor force rather than substituting the domestic labor force. The manufacturing industry, in particular, was found to have a complementary relationship between low-skilled workers and foreign workers. In the non-manufacturing industry, there was a complementary relationship between Korean workers and foreign workers, regardless of the skill level and classification of workers (i.e., low-skilled or highly skilled). In other words, the increase in employment of foreign workers did not lead to the decrease in employment of Korean workers.

The analysis, which depended on the size of the companies, indicated that for small and medium enterprises, there was a complementary relationship between low-skilled workers and foreign workers. In other words, small and medium enterprises, which have difficulty finding low-skilled workers, could only employ foreign workers. In addition, studies have concluded that the foreign workers substituted locals in the construction industry as well as in the food service and lodging industry (Lee and Park 2008; Yoo and Lee 2009).

For this reason, results on whether foreign workers and Korean workers had a substitutive relationship or a complementary relationship differed. However, studies regarding wages were substantially consistent because a few studies supported the theory that foreign workers decreased the wage level of some Koreans (locals).

Choi (2012) reported that when foreign workers with an education below high school level increased by 1%, the wages of Korean workers with an education below high school level decreased by 0.2%. In contrast, the wages of high school graduates and college graduates increased by 0.115% and 0.084%, respectively. In other words, the wage difference among Korean workers increased by 0.3%, based on education level.

Jo (2010) analyzed wage differences by using variables for locals and foreigners, such as gender, education level, age, continuous service year, labor union participation, industry, job type, and size of a company. Male and older foreign workers received a high wage. However, the effects of continuous service year, labor union participation, and education level were insignificant. Based on the hourly wage, the wage difference between foreigners and locals was approximately 50%, while the wage difference between the foreigners and non-regular local workers was 30%. It was suggested that the difference in human capital such as language skill induced the wage difference.

4. Hypothesis and Research Method

4. 1. Hypothesis

In this study, hypothesis testing was divided into two parts. First, the characteristics of the companies that employed foreign workers were examined. It is generally expected that companies employing many foreign workers are 3D business types or companies that South Korean workers typically avoid. Therefore, an examination of the characteristics of these companies can be used as an index for determining whether foreigners and South Koreans are competing in the same labor market. The hypothesis for testing this is as follows:

①Companies with low average per-capita sales revenues will employ foreign workers.
②Companies with no labor union will employ foreign workers.
③Companies with a high turnover of locals will employ foreign workers.

The second hypothesis of this study relates to the effects of the employment of low-skilled foreign workers on the employment of locals. The study examined whether the employment of locals decreased or increased and whether it varied depending on gender or skill level. Based on this, it can be determined whether foreign workers play a role in substituting for or complementing the South Korean workers:

④Employment of foreign workers will reduce the employment of new male South Korean workers.
⑤Employment of foreign workers will reduce the employment of new female South Korean workers.
⑥Employment of foreign workers will decrease the employment of new South Korean employees with prior work experience.

4. 2. Variables

Kwon and Jeon (2009) analyzed the characteristics of the companies that had actively employed foreign workers, based on the 2002 and 2003 Workplace Panel Survey (WPS) preliminary surveys. The present paper consulted the analysis method and was based on the following four surveys (2005, 2007, 2009, and 2011)

This research used the company's basic information (year of establishment, staff size, type of industry, establishment location), its financial information (net sales for previous and current year, net profit, sales profit per employee, liability), its competitiveness (price competitiveness compared with similar companies, quality competitiveness), and its employment (whether or not a labor union existed, turnover rate, employment of foreigners, recruiting new employees, recruiting career employees) as variables. Unlike Kwon and Jeon (2009), this research did not consider whether or not the annual salary system was

introduced, the rate of employees who largely used a computer, and the number of female employees.

4.3. Research method

4.3.1. Pooled Logit model

$$y^* = X_i\beta$$
$$y_i = \max(O, X_i\beta + \varepsilon_i)$$

First, a logit model was used to examine the difference between companies that employed foreign workers and companies that did not employ foreign workers.

In this study, using a logit model, companies that employed foreign workers were converted to 1, and companies that did not employ foreign workers were converted to 0. Then, the differences between these companies were compared.

4.3.2. Panel Logit model

The same data were analyzed based on a panel regression model. If it is assumed that an error term follows the logistic distribution rather than the normal distribution, it becomes a panel logit model. When an error term follows the normal distribution, it is called a panel probit model.

4.3.3. Panel Tobit model

A Tobit model was used to examine the effects of employment of foreign workers on the employment of South Korean workers. As mentioned earlier, the logit model assigned 1 to the companies that employed foreign workers and 0 to the companies that did not employ foreign workers. The panel Tobit model directly used the actual number of foreign workers.

A Tobit model is mostly used when part of the dependent variable is not observed and is censored. For example, in the case of the Workplace Panel Survey (WPS), there were many entities that did not employ foreign workers at all. However, the companies that did not employ foreign workers could have different characteristics. Also, in the logit model, a company that employed one foreign worker and a company that employed 100 foreign workers are identically expressed as “1.” Therefore, the Tobit model was more appropriate for analyzing the effects on employment of South Korean workers.

On the other hand, it was assumed that a company makes decisions on the selection of workers in sequence (e.g., a company employs foreign workers and then reduces employment of local workers) rather than determining the employment of foreign and South Korean workers at the same time.

5. Data

The Workplace Panel Survey (WPS) is a nationally approved statistical survey conducted

by the Korea Labor Institute, a government-funded policy research agency run by the Prime Minister's office.

Workplaces all over the country with more than 30 employees were used as the population, and the survey was conducted by selecting about 1,700 sample workplaces. The survey was carried out four times (2006, 2008, 2010, and 2012). In this survey, the conditions of companies were surveyed based on the previous survey year, and as such, the actual data are expressed as WPS 2005, WPS 2007, WPS 2009, and WPS 2011. For the current year (2014), a questionnaire survey based on 2013 is being carried out.

The Workplace Panel Survey aims to systematically analyze the employment structure and labor demand of workplaces, and to evaluate the human resources management system of companies. In addition, based on the follow-up survey of sample workplaces, changes in the employment management and human resources management of companies can be examined.

The Workplace Panel Survey consists of three kinds of questionnaires: one for human resources managers, one for labor union-management relations managers, and one for labor union representatives. The questionnaire for human resources managers includes contents relevant to the general characteristics of the workplace, employment status and employment management, reward and evaluation, human resources management and work organization, human resources development, and company welfare and industrial accidents. The questionnaire for labor union representatives includes contents relevant to the status of labor union-management relations and the statuses of the labor union and labor-management council.

The Korea Labor Institute sampled about 4,000 companies to be surveyed depending on the industry and company size. Among these companies, those that refused to respond, those with too many omitted responses, and those that went out of business were excluded. Thus, 1,700-1,770 companies actually completed the survey. Of these, some companies responded to all the four surveys, but other companies responded to only one to three surveys.

6. Results

6.1. Descriptive statistics

When we look at a total of 7147 observed values, they hire on average 1.90 foreign workers, with the smallest number being 0 and the largest number is 1000. Of the total companies, a total of 6266 companies (87.6%) do not hire even a single foreign worker while a total of 881 hire at least one foreign worker. (Table 2)

Table 2. Companies which hire foreign workers (1)

Variable	Obs	Mean	Std. Dev.	Min	Max
Foreign	7147	1.903596	17.81082	0	1000

Table 3. Companies which hire foreign workers (2)

Variable	Obs	Mean	Std. Dev.	Min	Max
Foreign	881	15.44	48.65	1	1000

When we look at the size of the 881 companies that hire foreign workers (Table 3), the companies that hire 1-49 foreign workers account for 20.43%, the companies that hire 50-99 foreign workers account for 20.20%, the companies that hire 100-199 foreign workers account for 22.36%, and the companies that hire more than 300 foreign workers account for 27.36%. The size of a company (staff size) is not largely related to whether or not foreign workers are employed.

6.2. Characteristics of companies that employed foreign workers

Companies that employed foreign workers were designated as 1, while companies that did not employ foreign workers were designated as 0. The two groups were analyzed. All the industries were first analyzed, and only the manufacturing industry was analyzed twice.

Analysis of all the industries (Table 4) indicated that the manufacturing industry showed the most active employment of foreign workers. Second, the companies with low per-capita sales revenues employed many foreign workers. Third, small-scale companies had a high probability of employing more foreign workers. Fourth, companies without a labor union tended to employ foreign workers. This could imply that a strong labor union can communicate the position of the South Korean workers to the company, preventing the company from employing many foreign workers. Alternatively, this could imply that a company that is large enough to have a labor union does not employ many foreign workers.

Analysis of the studied period (2005–2011) indicated that there was no evidence that employment of foreign workers either increased or decreased after 2005. In other words, employment of foreign workers after the implementation of the Employment Permit System for Foreigners had similar levels during each observation period.

Table4. Characteristics of companies that employed foreign workers

VARIABLES	All industries & the logit model	All industries & the panel logit model	Manufacturing industry & the logit model	Manufacturing industry & the panel logit model
Sales revenue per worker	-0.162***	-0.176***	-0.262***	-0.383***
	(0.033)	(0.059)	(0.044)	(0.093)
Presence of a labor union	-0.692***	-1.109***	-0.575***	-1.005***
	(0.113)	(0.216)	(0.140)	(0.301)
Size2	0.375***	0.351	0.457***	0.473
	(0.145)	(0.258)	(0.158)	(0.309)
Size3	0.547***	0.814***	0.516***	0.756**
	(0.141)	(0.265)	(0.156)	(0.324)
Size4	0.623***	0.980***	0.615***	0.945**
	(0.174)	(0.311)	(0.200)	(0.393)
Size5	0.471***	0.861***	0.200	0.288
	(0.148)	(0.275)	(0.178)	(0.367)
Year 2005	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Year 2007	0.162	0.225	0.161	0.260
	(0.122)	(0.163)	(0.142)	(0.203)
Year 2009	-0.214	-0.296*	-0.226	-0.355
	(0.130)	(0.176)	(0.150)	(0.217)
Year 2011	0.030	0.087	-0.025	0.017
	(0.121)	(0.167)	(0.142)	(0.212)
Construction Industry	-1.561***	-2.568***		
	(0.258)	(0.480)		
Service Industry	-1.808***	-2.626***		
	(0.111)	(0.224)		
Age	0.004	0.006	0.005	0.013
	(0.003)	(0.007)	(0.004)	(0.010)
Region	0.176*	0.350*	0.023	-0.044
	(0.093)	(0.192)	(0.105)	(0.245)
Wage level	-0.233**	-0.346*	-0.339**	-0.447**
	(0.119)	(0.183)	(0.138)	(0.226)
Constant	-7.972	-13.857	-10.451	-25.224
	(6.735)	(13.246)	(8.238)	(19.321)
Constant			-10.451	-25.224
			(8.238)	(19.321)
Constant				
Observations	5,090	5,090	2,427	2,427

Standard errors in parentheses
*** p<0.01, ** p<0.05, *p<0.1

6.3. Analysis of the relationship between employment of local workers and employment of foreign workers

6.3.1. All industries

Table 5. Relationship between employment of local workers and employment of foreign workers (All industries)

Variables	Proportion of employment of non-regular South Korean employees	New male regular employees	New female regular employees	New employees with prior work experience
Sales revenue per worker	-0.117	-0.717*	-1.606***	-2.638***
	(0.323)	(0.367)	(0.483)	(0.593)
Presence of a labor union	1.677	-4.468***	-9.200***	-8.420***
	(1.290)	(1.449)	(1.912)	(2.305)
Size2	8.705***	-3.555*	-5.522**	-3.610
	(1.893)	(1.914)	(2.636)	(3.024)
Size3	15.682***	-7.740***	-8.973***	-1.204
	(1.928)	(1.972)	(2.674)	(3.102)
Size4	16.981***	-11.328***	-12.001***	-3.139
	(2.178)	(2.326)	(3.108)	(3.687)
Size5	22.338***	-12.615***	-15.439***	-6.982**
	(1.905)	(1.969)	(2.652)	(3.100)
Year 2007	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Year 2009	-0.646	-1.773*	-2.545*	-1.310
	(0.893)	(1.067)	(1.383)	(1.720)
Year 2011	1.388	-1.616	0.045	0.329
	(0.865)	(1.033)	(1.330)	(1.659)
Construction Industry	15.669***	-9.912***	-11.864***	18.498***
	(2.691)	(2.869)	(3.948)	(4.441)
Service Industry	17.959***	-16.585***	-19.268***	-4.862**
	(1.366)	(1.428)	(1.846)	(2.258)
Age	-0.004	-0.046	-0.059	-0.036
	(0.039)	(0.044)	(0.056)	(0.070)
Wage level	1.405	-1.293	-0.570	-0.168
	(1.158)	(1.375)	(1.779)	(2.195)
Region	-1.532	0.667	1.069	11.535***
	(1.238)	(1.317)	(1.718)	(2.089)
Lforeign	-1.370**	0.680	1.032	-0.712
	(0.681)	(0.712)	(0.893)	(1.122)
Constant	-21.793	196.718**	228.618**	102.994
	(78.639)	(87.510)	(112.123)	(138.882)
Observations	3,892	3,512	2,905	3,607

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The effects of employment of foreign workers on the employment of South Korean workers were analyzed using the panel Tobit model. The dependent variables that were used to measure the effects on South Korean workers included: (i) the proportion of non-regular employees in a company ; (ii) the proportion of male regular employees among the new South Korean employees ; (iii) the proportion of female regular employees among the new South Korean employees ; and (iv) the proportion of employees with prior work experience among new South Korean employees.

In conclusion, the analysis of all the industries indicated that foreign workers and non-regular local employees had a substitutive relationship (Table 5). In other words, the non-regular South Korean employees were competing with foreign workers for the same position. There was no statistically significant relationship with the remaining dependent variables: the proportions of male regular employees, female regular employees, and employees with prior work experience among the new South Korean employees.

6.3.2. Manufacturing industry

When only the manufacturing industry was analyzed, no significant relationship was found between the employment of non-regular local employees and the employment of foreign workers. In other words, foreign workers and non-regular South Korean employees in the manufacturing industry did not have a substitutive relationship.

However, as the employment of foreign workers increased, the proportion of female regular employees among the new employees also increased (Table 6). This could be because the job characteristics of men and women were different even between the local workers. For example, there may have been a field where most of the manufacturing jobs were done by women, or, in jobs involving site work, women may have worked in different fields, such as finance and personnel administration.

In contrast to public perception, foreign workers (both non-regular and regular) and male local workers in the manufacturing industry were not found to have a substitutive relationship. This indicates that employment of foreign workers by a company could be determined by factors other than labor cost reduction. The company environment or an economy that is favorable for business is an important factor in changing the mind of an employer. Therefore, an employer makes decisions based on the general management environment, demand prediction, and economy rather than selecting foreign workers only because of labor cost considerations.

The second possibility is that an employer could prefer South Korean workers to foreign workers if the wage difference is not too large. When there is a choice, an employer may prefer South Korean workers.

On the other hand, an endogeneity was not estimated because there were too many 0 values among the observations. The estimation of an endogeneity determination should be

Table 6. Relationship between employment of local workers and employment of foreign workers (Manufacturing industries)

VARIABLES	Proportion of employment of non-regular South Korean employees	New male regular employees	New female regular employees	New employees with prior work experience
Sales revenue per worker	0.789**	-0.413	-2.197***	-1.167
	(0.374)	(0.468)	(0.685)	(1.032)
Presence of a labor union	1.539	-4.787***	-5.554**	-8.590**
	(1.268)	(1.584)	(2.305)	(3.523)
Size 2	2.461	0.542	0.450	6.516
	(1.766)	(1.865)	(2.847)	(4.140)
Size 3	4.599***	-3.123*	-0.644	8.621**
	(1.746)	(1.879)	(2.833)	(4.178)
Size 4	6.709***	-4.771**	-0.113	6.365
	(2.012)	(2.334)	(3.434)	(5.170)
Size 5	7.715***	-3.869*	-4.571	3.940
	(1.798)	(2.043)	(3.024)	(4.557)
Year 2007	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Year 2009	-1.108	-1.360	-1.592	-0.271
	(0.886)	(1.129)	(1.669)	(2.491)
Year 2011	1.484*	-1.437	1.508	4.042*
	(0.852)	(1.101)	(1.612)	(2.414)
Age	-0.096**	0.014	0.045	0.089
	(0.039)	(0.047)	(0.067)	(0.105)
Wage level	0.765	-1.799	-2.678	-1.959
	(1.012)	(1.336)	(1.946)	(2.933)
Region	-2.190*	1.478	1.809	12.342***
	(1.119)	(1.276)	(1.826)	(2.822)
Lforeign	-0.259	0.734	1.595**	-0.732
	(0.487)	(0.579)	(0.812)	(1.264)
Constant	173.032**	70.407	14.770	-163.990
	(78.541)	(94.442)	(133.965)	(210.410)
Observations	1,859	1,668	1,355	1,709

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

judged excluding 0, but this was thought to be an excessively arbitrary determination.

6.3.3. Measurement of the marginal effect

When all the industries were divided into the manufacturing, construction, and service categories, the effects of the employment of foreign workers were ranked in the order of

service industry > construction industry > manufacturing industry. Then, we asked, can this degree of effect be expressed using margins? The marginal effect is meaningful because it can quantify the degree of the effect. This is called “post-estimation analysis.”

In the case of all industries (Fig 1), when five (lforeign = 1.6) and ten (lforeign = 2.3) foreign workers were employed, the probability of employing non-regular South Korean employees decreased. When five more foreign workers were employed, the probability of employing non-regular employees in all industries decreased by 4%P, from 39 to 35%.

When the marginal effect was examined depending on the industry code (ind10), foreign workers more substantially substituted for non-regular South Korean employees in the service and construction industries. The larger effect of the foreign workers on the South Korean labor market compared to that in the manufacturing industry is thought to be because there were many compatriot workers (H-2 visa holders) who have “similar labor quality and high substitutability.” Compatriot workers can speak Korean as fluently as South Koreans can and have similar appearances; thus, many compatriot workers have been employed as caregivers, babysitters, and restaurant employees.

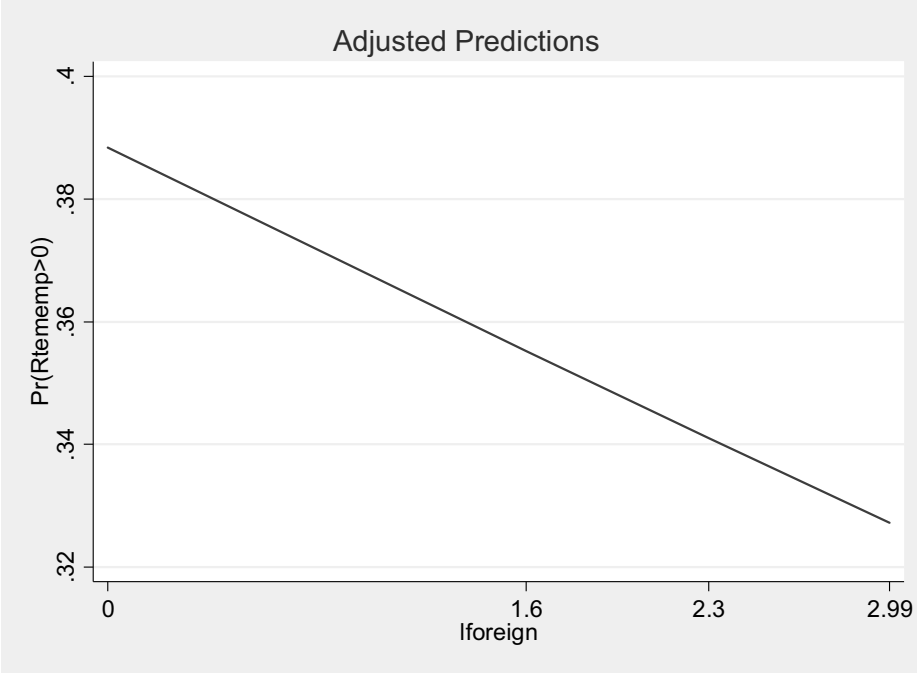

Fig 1. Probability that a company employs non-regular South Korean employees (All industries)

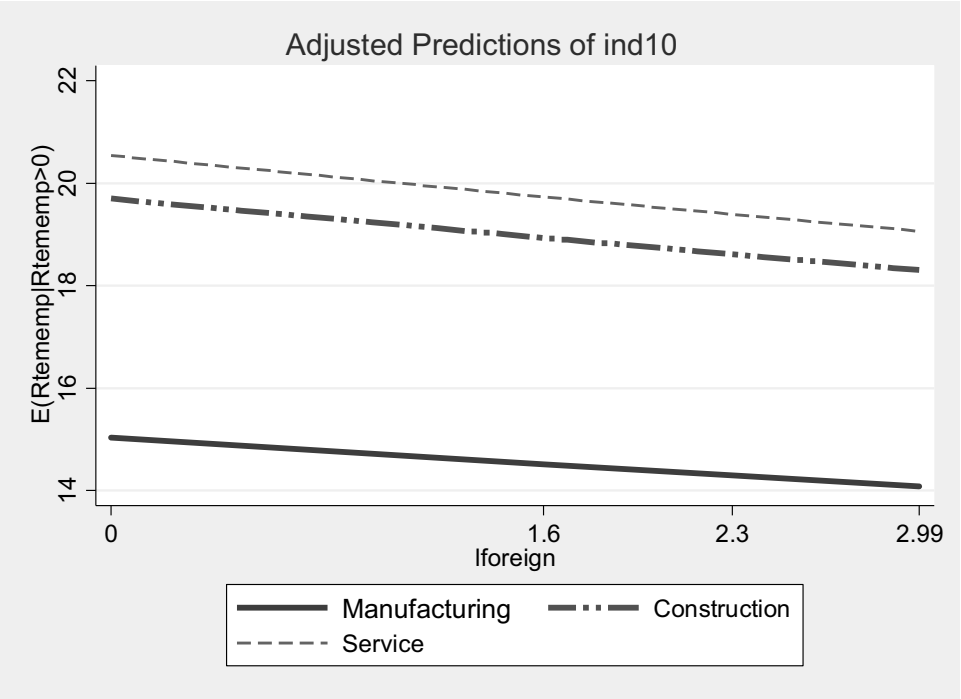

Fig 2. Probability that a company employs non-regular South Korean employees (Each industry)

Despite the high substitutability of compatriot workers of Chinese nationality they did not have a large effect on the employment of South Korean workers in the manufacturing industry. This could be because companies in the manufacturing industry where foreign workers work had working conditions that the South Korean workers originally did not want. These companies could be workplaces that the non-regular South Korean employees did not select from the beginning due to the labor cost, work time, or work environment. This indicates that foreign workers were employed in the workplaces that South Korean workers avoided. Employers say, "It is difficult to find South Korean workers, and thus, the South Korean government should accept more foreign workers. The total quota needs to be increased." In the case of the manufacturing industry, the results of this study provide evidence that supports the above assertion.

7. Conclusion

Analysis of the 2005–2011 Workplace Panel Survey (WPS) data based on a logit model, a panel logit model, and a panel tobit model indicated that for the manufacturing industry, there was no evidence that the employment of foreign workers affected the employment of South Korean (local) workers.

On the other hand, for the service and construction industries, when the number of foreign

workers increased by 5, the probability of employing non-regular South Korean employees decreased by 4%P. If this effect occurs across the industries rather than only in certain companies, there is a possibility that foreign workers in the service industry will substitute for South Korean workers. However, in the case of the manufacturing industry, the effect on the employment of South Korean workers was insignificant, which contrasts the general public's expectations. This indicates that foreigners work in the companies or industries that South Korean workers avoid, which can be interpreted as a positive sign of mutual benefit.

Examining the characteristics of companies that employed foreign workers indicated that many were small-scale companies with low per-capita sales revenues. Also, companies without a labor union tended to employ foreign workers.

The data used in this study had limitations. The survey was conducted at the company level, and thus, only the information reported by companies could be obtained, rather than characteristics of individual workers. Therefore, further studies will require a panel survey of foreign workers. Based on this long-term tracking relationship, the policy could be changed and adjusted so that the migration of manpower can contribute more to the benefit and welfare of both parties.

(Received 30th October, 2015)

(Accepted 1st February, 2016)

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Appendix. Explanation of the variables used in this study

	Variable	Name of the variable	Explanation
Basic information	Id	Identification	Identification assigned to a workplace (company); used for the panel survey
	Year	Survey year	2005, 2007, 2009, 2011
	Age	Year of workplace establishment	(Survey year – year of establishment)
	Size	Size of a workplace	Size 1=1 person-49 persons Size 2=50 persons-99 persons Size 3=100 persons-199 persons Size 4=200 persons-299 persons Size 5=over 300 persons
	La_ind9	Industry classification	Manufacturing industry, construction industry, service industry, and others
	Region	Division of regions	Divided based on the location of a workplace (Seoul, Gyeonggi, Incheon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, Gyeongnam, and Jeju)
Financial position	(*)sales_01	Sales revenue in the current year	
	(*)sales_02	Sales revenue in the previous year	
	(*)net_profit	Net profit in the current year	
	ln_lpsale	Sales revenue per worker	Log (sales per worker)
	(*)debt	Total amount of debt at the beginning of the year	
Competitiveness of a workplace	Dprice	Price competitiveness of a main product	Whether the price of a main product or service is cheaper than that of a

			competing company (cheaper=1, more expensive or equal=0)
	Dqual	Quality competitiveness of a main product	Whether the quality of a main product or service is higher or lower than that of a competing company (lower=1, higher=0)
	Dwage	Wage level compared to those of the other companies in the same industry	Whether the wage of the workers is higher or lower than that in a competing company
Labor and employment	Dunion	Presence of a labor union	Labor union absent=0 Labor union present=1
	(*)r_leave1	Turnover of locals 1	Whether the turnover is higher or lower than that of a competing company
	r_leave2	Turnover of locals 2	Proportion of those who left the company among the total workers
	(*)foreign	Number of foreign workers	Sum of the number of male foreign workers and the number of female foreign workers
	(*)rtememp	Proportion of employment of non-regular South Korean employees	Proportion of non-regular employees among all South Korean workers
	(*)rregemp_m	New male regular employees	Proportion of male regular employees among new South Korean employees
	(*)rregemp_f	New female regular employees	Proportion of female regular employees among new South Korean employees
	(*)rregemp_skilled	New employees with prior work experience	Proportion of employees with prior work experience among new South Korean employees

Source: Modified from The analysis method used in the study by Kwon and Jeon (2009). The variables marked with (*) were newly included in the present study.